



Management of basal stem rot disease in coconut through participatory approach

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Abstract

Management of basal stem rot disease in coconut was attempted in farmers' field by integrating cultural, biological and chemical means. Adoption of integrated disease management practices contained further spread of the disease and increased the nut yield. Population of *Pseudomonas fluorescens* and *Trichoderma viride* was found to increase in the fields. Adoption of integrated disease management technologies resulted in increased income from Rs. 63 to 122 / palm / year.

Introduction

Coconut is cultivated in an area of 19.14 lakh ha in India with an annual production of 15.84 million nuts (2006-07). India ranks first in the total coconut production in the world. More than 50 diseases have been reported in coconut throughout the world and among them basal stem rot caused by species of *Ganoderma* has been identified as a serious disease, causing heavy loss in yield. The symptomatology, host range, etiology and epidemiology were reviewed (Bhaskaran *et al.*, 1984), and based on these studies several control measures were adopted to control the disease. Various management practices like

management of soil moisture, effect of organic manures, effect of fungicides and chemicals were attempted. However, these management practices were found effective only if the disease is detected in early stages (Bhaskaran *et al.*, 1996). The basal stem rot disease causes 15 to 25 per cent damage to roots and bole below the ground level by the time external symptoms are visible.

The awareness, involvement and self motivation of the farmers are the important criteria that decide the success of any pest control strategy. Hence, in the present study, attempts were made to manage the basal stem rot in coconut in farmers' holdings fully by involving farmers using agronomic/cultural, biological and chemical methods of disease management.

Materials and methods

Twenty coconut gardens were selected in farmers holding at Thamarankottai, Parakkalakottai, Mannankadu, Krishnapuram and Mahizhankottai villages with an area of one ha each and the following technologies were imposed.

1. Agronomic/cultural

- a. Basin method of irrigation
- b. Application of recommended dose of fertilizers (RDF)

Adoption of integrated disease management practices contained further spread of the disease and increased the nut yield. Adoption of integrated disease management technologies resulted in increased income from Rs. 63 to 122 / palm / year.

- c. Application of 5 kg of neem cake / palm / year
- d. Application of 50 kg of FYM/ palm / year
- e. Basin management with 50 g of sunnhemp and in situ incorporation
- f. Intercropping with banana in two rows within two rows of coconut.

2. Biological

- a. Application of *Trichoderma viride* @ 200 g / palm / year
- b. Application of *Pseudomonas fluorescens* @ 200 g / palm / year

3. Chemical

Root feeding with calixin / hexaconazole @ 2 ml with 100 ml of water at quarterly interval.

Nuts were harvested and nut yield / palm were calculated before and after imposing the treatments. The nuts were sold out in the market and the increase in income (Rs.) / palm / year after the adoption of IDM technologies were calculated. Before applying the treatments the initial disease index in all locations were worked out using the following formula,

$$DI = 23.6 + 17.7h + 3.6 \times r - 0.6 \times l$$

Where h = height of bleeding in meters

r = reduction of leaf size in 0-4 scale

l = number of functional leaves in the crown

Subsequently the disease intensity was recorded at quarterly interval. The population of

Trichoderma viride and *Pseudomonas fluorescens* was recorded before imposing the treatments and later at six monthly intervals.

Results and Discussion

In all fields increase in nut yield (mean : 66 nuts / palm / year) was observed after imposing the treatments when compared to the initial (mean : 58 nuts / palm / year) nut yield. There was no further increase in disease incidence after the treatments were applied. The mean initial disease index recorded was 22.43 compared to the disease index of 22.20 recorded one year after the treatment. The disease

incidence ranged from 10.5 to 45.25 both at the beginning of the experiment and at one year after the imposition of the treatments. This clearly shows the effectiveness of the treatments in containing the further spread of the disease (Table 1). The increase in income due to the adoption of IDM technologies ranged from Rs. 63-122 / palm / year.

The population dynamics of two biocontrol agents viz., *Trichoderma viride* and *Pseudomonas fluorescens* were assessed at the beginning of the study and thereafter at 6 and 12 months later. Both the bio-agents exhibited tremendous increase in their population in the rhizosphere

Table 1. Effect of integrated disease management practices adopted for basal stem rot management in coconut on nut yield and disease index

Farmer	Nut yield (Number / palm / year)		Disease index		Income increase (Rs. / palm / year) after the adoption of IDM technologies
	Initial	After 1 year	Initial	After 1 year	
Saroja, M.	65	80	20.5	19.6	80.00
Vairavasundaram, R.	65	73	28.2	28.0	104.00
Ariyamuthu, T.	70	80	14.9	14.5	91.00
Subramanian, S.	62	75	40.0	40.0	28.00
Katha Velalar, C.	52	63	22.9	23.0	108.00
Narayanasamy, C.	55	60	24.5	24.5	122.00
Tamilselvi, S	60	65	17.4	17.4	100.00
Arunachalam, V.	62	69	25.3	25.0	73.00
Goviudhan, B.	62	70	17.0	17.0	65.00
Natarajan, M.	65	70	12.94	12.0	77.00
Palamidurai, R.	67	75	22.8	22.0	101.00
Balasubramanian, R.	60	65	20.8	20.8	94.00
Balusamy, K.	65	71	35.5	30.0	103.00
NMS. Jehabar Ali, G.	58	63	10.5	10.5	103.00
Rajendran, B.	55	60	10.9	10.9	66.00
Karthikeyan, K.	50	55	15.5	20.5	63.00
Selvanayagam, P.	45	55	45.25	45.25	66.00
Venkatachalam, B.	55	63	18.5	18.0	66.00
Abdul Munaf, M.	52	60	25.2	25.0	72.00
Bazeer Ahamad, G.	50	57	20.15	20.15	65.00
Mean	58.75	66.45	22.43	22.20	82.35

Table 2. Effect of integrated disease management practices adopted for basal stem rot management in coconut on the population dynamics of biocontrol agents

Farmer	Population of <i>T.viride</i> (Cfu x 10 ³ / g dry soil)			Population of <i>P. fluorescens</i> (Cfu x 10 ⁵ / g dry soil)		
	Initial	6 months	1 year	Initial	6 months	1 year
1	65.0	100.0	150.0	37.0	51.7	100.0
2	42	105	120.0	40.4	56.6	98.0
3	33.5	95.0	110.0	32.0	46.6	70.0
4	43.9	101.0	110.0	37	45.3	90.0
5	40.2	67.0	98.0	38.0	51.3	85.0
6	33.7	65.0	80.0	32.0	50.1	80.0
7	45.2	60.3	75.0	35.0	50.0	65.0
8	40.8	65.5	75.0	25.5	46.0	60.0
9	39.2	55.3	68.0	28.0	45.0	65.0
10	65.0	106.0	131.2	31.2	52.3	100.0
11	60.5	99.0	150.0	50.5	70.2	105.0
12	52.2	75.0	90.0	28.1	47.0	65.0
13	67.0	102.0	120.0	35.5	60.7	90.0
14	62.3	80.0	95.0	23.2	46.0	60.0
15	65.2	90.0	105.0	30.1	43.6	60.8
16	40.2	70.0	80.2	28.5	41.5	60.0
17	35.5	75.0	80.8	34.2	45.0	60.0
18	47.0	85.0	95.0	33.1	49.2	65.0
19	33.0	60.0	70.0	29.8	55.5	68.0
20	39.0	65.0	75.0	32.3	52.0	65.0
Mean	47.52	81.05	98.91	33.07	50.28	75.59

region of the treated palms. The mean population of *T.viride* at the beginning of the experiment was 47.52 x 10³ cfu / g dry soil and it has increased 81.05 and 98.91 x 10³ cfu/ g dry soil respectively at 6 and 12 months later. *Pseudomonas fluorescens* increased from a mean population of 33.07 x 10⁵ cfu / g dry soil before the application of treatments to 75.59 x 10⁵ cfu / g dry soil at 12 months after treatment (Table 2).

Application of neem cake has been found effective to control many soil-borne diseases (Maiti *et al.*, 1987). *Pseudomonas* and *Trichoderma* have been proved effective to control several Plant Pathogens. In the present study, the disease suppression may be due to the increase in the population of the bio agents / due to direct fungitoxic effect of neem cake

on the pathogen or both besides having the effect of other practices included in the package of IDM.

Hitherto the disease was being managed through the root feeding of calixin. However, an integrated approach to keep the health of the palm and its yield potential was required at the early diagnosis of the disease. Therefore, various practices involving agronomic/cultural, biological

and chemical were included in the present study and they were found effective in managing the disease and increasing the yield.

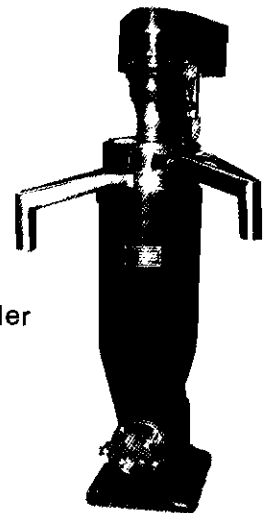
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